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andria; (4) The Postulates of Astronomy According to Ptolemy; (5) The Sphericity of the Earth; (6) The General Movement of the Planets; (7) The Circles of the Sphere; (8) The Length of the Solar Year; (9) The Tables of the Sun; (10) The Periods of Hipparchus for Lunar Movements; (11) The Tables of the Moon; (12) The Parallaxes of the Sun and the Moon; (13) The Prediction of Eclipses (14) The Theory of the Planets; and (15) The Catalogue of the Fixed Stars.

An appendix contains a number of studies on important special points, and also a translation of an Arabic treatise by M. De Vaux on Celestial Spheres. *μκρκ*

COURS COMPLET DE MATHÉMATIQUES ÉLÉMENTAIRES. Publié sous la direction de *M. Darboux*, doyen de la Faculté des Sciences de Paris. Paris: Armand Colin et Cie., 5 rue de Mézières.

Leçons d'Arithmétique théorique et pratique. Par *Jules Tannery*. Large 8vo. Pp., 510. Price, 5 fr.

Leçons de Géométrie (Géométrie plane). Par *Jacques Hadamard*. Large 8vo. Pp., 308. 6 fr.

Leçons d'Algèbre élémentaire. Par M. C. Bourlet. Large 8vo. Pp. 550. 7 fr. 50.

Leçons de Trignométrie rectiligne. Par *M. C. Bourlet*. Large 8vo Pp., 322. 6 fr.

Leçons de Cosmographie. Par MM. *Tisserand* et *H. Andoyer*. Large 8vo. Pp., 370. 6 fr.

The new "complete course of elementary mathematics" now publishing in France under the supervision of M. Darboux, member of the Institute and dean of the Faculty of Sciences at Paris, is in many respects a notable one, and, as the expression of one of the most significant reforms of modern education, deserving of the best attention of American and English instructors of mathematics, as well as of all others interested in this study. The language of the books is easy, and the commonest reading knowledge of French will suffice for access to this unique store of knowledge, compiled by some of the best of modern specialists under the direction of one of the most distinguished of living mathematicians. The books are instinct with the modern spirit, are thoroughly alive to the exigencies of present life and practice, and are remarkably cheap. In addition, they deviate so widely from the inherited routine practices of American and English text-book making as to furnish, through this feature alone, a powerful stimulus to the student or teacher.

The first volume is the *Arithmetic* of M. Tannery (510 pages),—a complete, detailed and accurate exposition of the science, not containing everything under the sun, nor being a digest of everything ever written on the subject, but in the main practical and natural despite its insistence on method and the mass of apparent superfluities which so large a work must contain. It goes to the kernel of its subjects, begins with the concrete, proceeds gradually to the abstract, seeks to illuminate the *technique* of operations by the exposition of the logic at the bottom of them, and ultimately lands the student among the elements of the theory of numbers. The principles are uniformly emphasised; there are occasional historical notes; and great attention has been paid to the examples, which are not a collection of puzzles but an organic record of practical mathematical thought, culled from a multiplicity of sources. Noteworthy are the treatment of fractions and irrational numbers, the insistence on methods of approximation, the introduction of the notion of limits, and the discussion of the relations of continuous quantities and numbers.

The text-book on *Algebra* (548 pages) is by M. C. Bourlet, professor in the Lyceum of Henry IV. It begins with a long and detailed exposition of the theory of negative numbers, on the ground that a systematic exposition of the commutative, associative, and distributive properties of operations with numbers is fundamentally that of "algebraical operations." Examples of functions of a single variable have been introduced, as have also the graphical representation of the variation of a function, some few notions of analytical geometry, and the doctrine of derivatives. In the selection of methods, preference has always been given to that which admitted of subsequent extension. The employment of modes of exposition, which must afterwards be abandoned, has been absolutely eschewed. Thus an economy has been attained which in the higher branches is destined to bear multiple fruit. The author, who has consulted the classics and the best foreign text-books, has devoted the same care to the selection of his examples as M. Tannery, and produced upon the whole an exemplary work.

The treatise on *Plane Trigonometry* is also by M. Bourlet (322 pages). The bulk of the book is devoted to the matter required by the general French programme for elementary mathematics, while a more advanced appendix of 75 pages is designed for special students of mathematics. This appendix treats of the trigonometric representation of imaginary quantities, the formula of Moivre, the roots of imaginary quantities, binomial equations, and the trigonometrical resolution of cubic equations. The main text is divided into three parts. The exposition begins with a discussion of the theory of vectors, equipollency, resultants, algebraical and geometrical sums, projections, etc. The first book deals with the fundamental formulæ, the fundamental relations, and the fundamental operations. The second book deals with trigonometrical equations, the construction of tables, logarithms, etc. The third book is devoted to the solution of triangles, and the many various applications of the latter theory.

M. Hadamard's *Plane Geometry* takes up some 308 large octavo pages. In the composition of his work the author has kept the fact constantly in view that geometry occupies the first place in mathematical instruction. It is the simplest and most accessible form of reasoning, and the scope and fecundity of its methods are far more immediately palpable than those of the relatively abstract theories of arithmetic and algebra. In view of its unique position, the science is thus capable of exercising a powerful promotive influence upon the activity of the mind. This influence the author has sought to develop by arousing and fostering as much as possible the originality and initiative of the student. He has given as much room as possible to the exercises, which as a rule are of a studied, connected character. He has added in an appendix a valuable note on the methods of procedure in geometrical discovery, and also notes on the postulate of Euclid, regarding which the ideas of modern geometricians have taken so clear and definitive a form as to render it possible to give some exposition of their ideas in an elementary work. There is also a note on the problem of tangent circles and one on the notion of areas. To the third book, which treats of similitude, etc., a modern supplement has been added, treating of vectors, transversals, reciprocity, the anharmonic ratio, poles and polars, inverse figures, etc. All such innovations have given a distinctively modern stamp to the treatment, which in all matters where generality is involved departs radically from the methods of Euclid and Legendre; for example, the consideration of the directions of rotation of angles has enabled the author to give full generality to the propositions regarding circles, without rendering these propositions less simple or elementary.

The *Cosmography* of M. Tisserand, director of the Paris Observatory, and M. Andoyer, lecturer in the Faculty of Sciences of Paris, is a valuable contribution to the text-book and reading literature of astronomy. The authors understand the art of separating what is essential from what is accidental, without destroying the intrinsic beauty of the science. The many current fictions of astronomy are frankly stamped as such, and the solid acquisitions clearly delineated. The development of the text is clear, accurate, and methodical; little mathematics is required, and that not extending beyond elementary trigonometry. The most recent investigations have been recorded so far as possible, and twelve excellent plates, which have been made from the best modern photographs of the heavens, have been added to the work. Considerable matter of those branches which are called physical geography and mathematical geography has been incorporated. At the conclusion, more than one hundred pages have been given over to the history of astronomy, and to notes upon special technical points of difficulty.

The two succeeding volumes of the series are announced as being in the press; they are a treatise on solid geometry by M. Hadamard, and one on mechanics by M. Koenigs. μ.

LETTRES INÉDITES DE JOHN STUART MILL À AUGUSTE COMTE. Publiées avec les résponses de Comte et une introduction par *L. Lévy-Bruhl.* Paris: Félix Alcan. 1899. Pp., 560+xxxviii. Price, 10 fr.

The Letters of August Comte to John Stuart Mill were published in 1877 by the Society of Positivists. The letters of Mill were not included in the volume. Professor Lévy-Bruhl, who was fortunately able to procure a faithful copy of Mill's letters, now publishes the text of the correspondence on both sides.

The letters are eighty-nine in number, and extend over a period of six years